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Durchlaufofen mit einer Einrichtung zum Abschrecken von Werkstücken sowie Abschreckverfahren

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Abstract of DE19919738

The invention relates to a continuous furnace comprising a device for quenching workpieces. The device adjoins a lock for the removal of the workpieces. A quenching chamber (7) adjoins the lock (5) vertically and is connected to a pump station (13) for a cooling gas. An opening (12) which can be closed so that it is gastight is located between the lock (5) and the quenching chamber (7). The lock (5) is provided with a conveying device (8) which conveys the workpieces (1) between the lock (5) and the quenching chamber (7). The invention provides an energy-saving and environmentally sound means of quenching workpieces and at the same time avoids the disadvantages of the quenching in liquid quenching means.

Description of DE19919738

The invention relates to a continuous furnace with a mechanism for deterring from workpieces, whereby the mechanism follows an air-lock to the removal of the workpieces. Furthermore the invention concerns a method for deterring from workpieces.

The continuous furnace can be trained as pusher type furnace, roller hearth furnace or rotary-hearth furnace. The workpieces are during transport by the furnace on load carriers, on rusts or the like. In the furnace the workpieces are exposed Endogas to a reaction gas, here.

From practice is well-known to deter the workpieces after carburizing or Carbonitrieren in the continuous furnace in water, oil or salt baths, which follow the furnace. The use of liquid quenching media is problematic, because after deterring remainders from oil, salt or water additives far away from the workpieces and entsorgt to become to have. This can have environmental problems to the sequence. In addition the use of oil and salt is safety-relevant problematic as quenching media. The moreover the bandwidth of the advantages of

the workpieces, depending upon workpiece geometry, is very high with deterring in liquid quenching media.

Object of the invention is it to develop a continuous furnace with a mechanism for deterring and a method further in such a way for deterring that energy-saving and environmental careful deterring from workpieces is made possible.

This object is solved according to invention by the characteristic features specified in claim 1.

The workpieces are deterred, without having to take the problems initially specified when using liquid quenching media in purchase. Above all is void cleaning the workpieces adhering oil, salt or water additives, which has environmental problems to the sequence.

Deterring with cooling gas has the advantage that those delay of the deterred workpieces small and besides uniform are.

It is manufacture-technically favourable that the deterrence chamber exhibits only one opening to and discharge.

Preferably the deterrence chamber is disposed above the air-lock. This makes a substantial further training for the invention possible, which consists of the fact that those. Transport device with at least one spindle or similar mechanism is vertically moved and that the transport device is in such a manner trained that this locks the opening between air-lock and deterrence chamber during deterring.

After a further feature of the invention a transportation soil is intended for the horizontal transport of the workpieces by the air-lock with closed deterrence chamber below the transport device. This further training makes possible that during deterring the workpieces or a discharge of the continuous furnace is possible.

Preferably the transportation soil is in a firm distance disposed for transport device.

The deterrence chamber is according to invention implemented and provided with at least one rolling over fan pressure tight.

Process engineering the solution of the object posed consists of the fact that the workpieces in the air-lock are transported essentially vertically into a deterrence chamber, in which the workpieces under increased pressure are deterred by under 10 bar by means of rezirkuliertem cooling gas and that to flow of the deterrence time the workpieces are transported into the air-lock and taken out of this.

Preferably as cooling gas hydrogen is used.

Favourable way is flooded after completion of the deterrence time the cooling gas in a gas buffer.

Then the possibility according to invention consists of using the cooling gas of the gas buffer for heating purposes or for the production from reaction gas to.

The invention is more near described in the following on the basis a preferential embodiment in connection with the design.

The design shows in:

Fig. 1: a plan view on a rotary-hearth furnace plant in ring channel building method;

Fig. 2: a lateral partial section by the rotary-hearth furnace with the mechanism for deterring.

In Fig. 1 and 2 represented rotary-hearth furnace plant is used for hardening workpieces 1, here gears. The gears 1 are on load carriers 2 (S. Fig. 2), here on rusts stacked. The furnace plant exhibits a rotary-hearth furnace 3 in ring channel building method, in which the workpieces 1 under a reaction gas become heat treated, here Endogas. At a location an insulated Ofentür 4 is intended to and discharge.

The rotary-hearth furnace gas-tight an air-lock 5 follows 3, as in Fig the Ofentür 4. 2 represented, an output door 6 exhibits. Above the air-lock 5 is a deterrence chamber 7, which is implemented as pressure chamber with a water-cooled outer shell. The air-lock is provided with a transport device 8. The transport device 8 in the air-lock 5 can be driven into elevator driving fashion by means of several spindles 9 or similar mechanisms vertically under the Abschreckkammer 7. The transport device is in such a way trained that this can lock pressure tight an opening 12 between air-lock 5 and deterrence chamber 7, for example over so-called not represented finger pins.

The deterrence chamber 7 is attached to a pumping station 13 and a gas buffer 14 for a cooling gas. In the deterrence chamber are several rolling over fans 10, whose axes are perpendicular or parallel to the axis of the deterrence chamber 7 disposed and which are propelled by engines 11. In Fig. the cooling gas cools 2 represented heat exchanger 15, while it is rolled over. Below the transport device too this is a transportation soil 16 disposed, with closed deterrence chamber 7 a transport of the workpieces on the load carriers under the deterrence chamber made possible for 8 in firm distance. For this the spindles of 9 or similar drives of the transport device 8 lateral at four locations in the air-lock room 5 disposed are, so that the air-lock can be passed by a load carrier. The spindles 9 are equipped with a not represented radiation protection screen as thermic protection.

In the following the method according to invention is described for deterring:

After conclusion of the thermal treatment in the rotary-hearth furnace 3 the Ofentür 4 of the rotary-hearth furnace 3 is opened and a load carrier 2, z. B. a rust encountered by an actually well-known Querstosser the transport device of the air-lock. The transport device 8 is on same level as the hearth of the rotary-hearth furnace. As soon as the Querstosser drove through the Ofentür, this can be lowered up to a remainder measure, which permits the return trip of the Querstosser. After the Querstosser left the air-lock, the transport device 8 vertically under the deterrence chamber 7 is driven. The transport device 8 locks the deterrence chamber 7 gas-tight. During the transport of the workpieces is in the deterrence chamber, just like in the air-lock, the reaction gas used in the continuous furnace. The closed cold deterrence chamber is flooded by means of the pumping station 13 with a cooling gas, preferably a hydrogen or a nitrogen, and the workpieces with a pressure by under 10 bar, preferably 9.5 bar, by means of rezirkulierendem cooling gas is deterred.

If as cooling gas hydrogen is used, the hydrogen is flooded after flow of the cooling period with the pressure equalization on furnace pressure into the gas buffer 14 and buffered. The cooling gas can be stored, in order to use it several times as cooling gas, in order to finally use it for burn purposes. The cooling gas could be used also for the production by Endogas for the continuous furnace or be taken out of the gas buffer for heating purposes. After the pressure equalization on furnace pressure, around 3 mbar, becomes the deterrence chamber 7 with the reaction gas, here Endogas, purged. Afterwards the transport device 8 is lowered and the workpieces 1 from the deterrence chamber 7 into the air-lock 5 is transported. The transportation soil is in in Fig. 2 dashed represented position. The output door 6 of the air-lock 5 is in actually well-known way is provided with a burning gas veil. It can be so promptly opened that at the same time the transport device 8 arrives in the driving out level, if the output door 6 achieved its opened position. In addition at this time a represented well-known rust extractor can drive on the transport device 8 and not pull the rust 2 from the air-lock. The workpieces 1 are supplied to a not represented tempering furnace, which a cooling stretch can follow by way of an unloading memory course 17.

After exit of the rust 2 from the air-lock 5 the output door 6 of the air-lock is locked and the air-lock 5 with Endogas purged. The gas can become into the gas buffer 14 purged.

If nitrogen is used as cooling medium, with the rinsing procedure over a not represented torch/flare one rinses out.

The workpieces deterred with cooling gas under pressure exhibit only small ones delay, which are besides uniform. Washing of the workpieces afterwards is not necessary. Under the elevator principle the rinsing volume is small. With opened air-lock output door only the reaction gas used so far in the furnace is in the air-lock.

It is particularly favourable that a discharge and a Belanden of the continuous furnace are possible with closed deterrence chamber.

In the framework easily modification possibilities are given the invention. So the deterrence chamber can become also underneath the air-lock disposed.

#### Designation

- 1 workpieces
- 2 load carriers
- 3 rotary-hearth furnace
- 4 Ofentür
- 5 air-lock
- 6 output door
- 7 deterrence chamber
- 8 transport devices.
- 9 spindles
- 10 rolling over fan
- 11 engine
- 12 Öffnung
- 13 pumping station
- 14 gas buffers
- 15 heat exchangers
- 16 transportation soil
- 17 roller race

#### CLAIMS

1. Continuous furnace with a mechanism for deterring from workpieces, whereby the mechanism follows a lock to the removal of the workpieces thereby characterized, that vertical follows the lock (5) a deterrence chamber (7), which is connected to a pumping station (13) for a cooling gas, that between lock (5) and deterrence chamber (7) a gastight lockable opening (12) and that the lock is provided with a transport device (8), those the workpieces (1) between lock (5) and deterrence chamber (7) transported.

2. Continuous furnace according to claim 1, characterised in that the deterrence chamber (7) above the lock (5) disposed is.
3. Continuous furnace according to claim 1 or 2, characterised in that the transport device (8) with at least a spindle (9) or similar device vertical moved becomes and that the transport device (8) is in such a manner formed that the opening (12) between lock (5) and deterrence chamber (7) locks these during deterring.
4. Continuous furnace after one of the claims 1 to 3, characterised in that below the transport device (8) a transportation soil (16), to the horizontal transport of the workpieces (1) by the lock (5) with closed deterrence chamber (7), provided is.
5. Continuous furnace according to claim 4, characterised in that the transportation soil (16) in a fixed distance to the transport device (8) disposed is.
6. Durchlaufofen nach einen der Ansprüche 1 oder 5, dadurch gekennzeichnet, dass die Abschreckkammer (7) druckdicht ausgeführt und mit mindestens einem Umwälzventilator (10) versehen ist.
7. Methods for deterring from workpieces, which in a continuous furnace continuous a bottom reaction gas heat treated and from the continuous furnace into a lock transfered are, characterised in that the workpieces in the lock (5) essentially vertical into a cold deterrence chamber (7) transported become, in which the workpieces become bottom increased pressure of bottom 10 bar by means of recirculated cooling gas quenched that after flow of the deterrence time the deterrence chamber (7) with the reaction gas purged used in the pass furnace will and that the workpieces become transported into the lock (5) and from this removed.
8. Process according to claim 7, thus identified-draws that becomes used as cooling gas hydrogen.
9. Process according to claim 8, characterised in that after completion of the deterrence time the cooling gas into a gas buffer (14) is flooded.
10. Process according to claim 7 or 8, characterised in that the cooling gas from the gas buffer (14) heating purposes or the production of reaction gas used becomes.